REMARKS/ARGUMENT

This amendment is in response to the office action of July 2, 2002, in accordance with 37 C.F.R. § 1.111.

Claims 1 through 24 are pending in the application. Claims 1 through 4, 6 through 11, 13 through 20, and 22 are amended, claims 21, 23, and 24 are cancelled, and claims 25 through 50 are added by this response.

The additional claim fee of $414.00 is calculated on the first page of this response and is to be charged to Deposit Account Number 15-0700. A second copy for page 1 of this response is attached for this purpose.

1. Rejection of Claims 20 through 24 under 35 U.S.C. § 101

The Examiner rejects claims 20 through 24 under 35 U.S.C. § 101 stating that the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process. The applicant traverses this rejection and requests reconsideration.

Claims 20 and 22 are amended to overcome this rejection. Claims 21, 23, and 24 are cancelled. These changes to the claims are believed to address the Examiner's concerns. This rejection should be withdrawn.

2. Rejection of Claims 1 through 24 under 35 U.S.C. 112, Second Paragraph

The Examiner rejects claims 1 through 24 under 35 U.S.C. § 112, second paragraph, stating that the claims are indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. The applicant traverses this rejection and requests reconsideration.

The Examiner states that "within claim 18, it is unclear what level of cure is denoted by 'cured.'" (See the July 2, 2002, office action on page 3 at lines 5 and 6.) The applicant notes that claim 18 depends from claim 14 which recites that the final product "is present in the form of a structurally rigid object or formed part cured by radical polymerisation of the reactive double bonds of the preform." Irrespective of whether or not all double bonds have reacted, any stage of cure would and should fall under the scope of claim 18.

The Examiner states that it is unclear what is meant by "nonradical-triggered polyaddition reaction" and asks if this language refers to the reaction between the isocyanate groups and the hydroxyl groups. (See the July 2, 2002, office action on page 3 at lines 10 and 11.) The applicant

notes that he Examiner's understanding of the "non-radical-triggered polyaddition reaction" is correct. The applicant nevertheless amends the claim language to clarify this term.

The Examiner states that the phrase "energy-rich radiation" as recited in claim 6 is unclear. The original German technical term "energiereiche Strahlung" was poorly translated. The applicant amends claim 6 by replacing the phrase "energy-rich radiation" with the correct translation, "high-level radiation."

The Examiner states that the applicant has failed to specify a basis for the weight percentages recited in claims 7 and 10. Support for the percentage recited in claim 7 is found in Examples 5 and 6 of the specification. (See the specification on page 13 at line 15 through page 15 at line 10.) The specification provides support for the percentage recited in claim 10 on page 10 at lines 16 through 27.

The Examiner states that it is unclear how the term "technical formed" further defines parts and how the term "design and support" further defines elements within claims 22 and 23. The original German terms "Konstruktionselemente" and "Stützelemente" are less ambiguous or indefinite than their literal English counterparts "construction elements" and "support elements." The terms are intended to refer to formed bodies for technical appliances in building and construction, e.g., as (parts of) mechanical construction elements or as (parts of) devices for mechanical support.

The applicant amends claims 1 through 20 and 22 to overcome this rejection. This rejection is believed to be moot.

3. Rejection of Claims 1 through 7, 10 through 15, 17, and 19 through 24 under 35 U.S.C. § 102(b)

The Examiner rejects claims 1 through 7, 10 through 15, 17, and 19 through 24 under 35 U.S.C. § 102(b), stating that the claims are anticipated by U.S. Patent Number 4,787,850 to Michl et al. or U.S. Patent Number 5,254,604 to Mori et al. or European Patent Application Publication Number 0269071. The Examiner states that these patent documents disclose all of the limitations of claims 1 through 24 and cites to the abstract and columns 2 through 4 of the Michl et al. patent, the abstract and columns 4 and 5 of the Mori et al. patent, and the entire disclosure of the European Publication. The applicant traverses this rejection and requests reconsideration.

The Michl et al. patent discloses the manufacture of polyurethane products which are produced using siocyanate and bis-GMA as the reactive monomers. Only these two compounds take part in the ureathane reaction or "polyaddition" and form the polyurethane matrix. The further added

components butanediol dimethacrylate and decanediol dimethacrylate do not take part in the urethane reaction and can easily be extracted from the polyurethane product. Since they contain reactive double bonds, the resulting polyurethane products do not fulfil the requirements of the instantly claimed invention (i.e., freedom from extractable monomers with reactive double bonds).

Moreover, the sole purpose of the polyurethane material of the Michl et al. patent is the manufacture of a reactive, radical-polymerizable filler in the form of a powder, which together with other components is used in the production of dental material. The Michl et al. patent do not disclose or render obvious the manufacture of a flexible, optionally elastic, polyurethane preform. Also, there was no need for Michl et al. to care for emission-free storage and further processing of the polyurethane material, because the amounts used in dentistry are tiny compared to industrial scale amounts of a technical polyurethane plastics material as is envisaged in the present application. It would not have been possible to use the polyurethane material of the Michl et al. patent, e.g., for wrapping a broken leg therewith and to stabilize the leg by curing the polyurethane material on site. It is, however, possible using the flexible polyurethane preform of the present invention.

The Mori et al. patent discloses a wax-like thermoplastic material which is produced from diisocyanates and hydroxy(meth)acrylates, which -- unlike in the present invention -- contain only one hydroxyl group per monomer. This means that the Mori et al. polyurethane material, before final cure, is solid at room temperature and has a melting point of 60 to 80°C, which clearly indicates to a person of ordinary skill in the art that this material is of a linear, i.e., not crosslinked, nature and belongs to the group of thermoplasts. In contrast to the Mori et al. polyurethane material, the present invention relates to crosslinked polyurethane-preforms that are duroplastic, flexible, and preferably even elastic at room temperature and do not have a melting point.

The European Publication discloses the manufacture of a polyurethane-based material for making dental impressions, wherein in a first step a hydroxy-group containing oligomer (polypropylene glycol) which does not contain unsaturated reactive double bonds is reacted with diisocyanate to form a first polyurethane product having two isocyanate end groups (see claim 19). In a second step, the polyurethane material of the first step is reacted with an unsaturated hydroxyl substituted organic ester (e.g., hydroxyethylmethacrylate) to form a derivated polyurethane. In a third step, the derivated polyurethane material is reacted with a lower alkyl diaol and in yet another step the resulting derivated polyurethane material is still reacted with a further compound obtained from the reaction of a diisocyanate and an unsaturated organic acid ester. The polyurethane-

preforms of the European Publication do not contain at least 0.5 mmole/g of reactive double bonds, because it is made prevailingly from a hydroxy-group containing oligomer that has no reactive double bonds.

The European Publication not only discloses a different method of making the polyurethane product (i.e., a four-step process vis-à-vis a two-step method of the present invention), it also utilizes different starting materials and therefore yields a different final product.

The Examiner is required to support a rejection based upon anticipation with a citation that discloses each and every claimed element. The cited patent documents fail to disclose each and every element of the applicant's claims. This rejection should be withdrawn.

4. Conclusion

The application is believed to be in condition for allowance. Favorable consideration is respectfully requested.

Respectfully submitted,

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APPENDIX A

"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

IN THE CLAIMS:

Please cancel claims 21, 23, and 24 without prejudice.

Please amend claims 1 through 4, 6 through 11, 13 through 20, and 22 as follows.

1. (Amended) Method for the production of moulded bodies of a polyurethane material where

(a) a mixture of starting components is prepared which contains, on one hand isocyanate and on the other hand monomers with reactive double bonds and containing hydroxyl groups where the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate; and

(b) the mixture is subjected to a polyaddition reaction that is not triggered by radicals and that is generating a radical-polymerisable polyurethane preform having a content of nonextractable, reactive double bonds -- as determined by DSC - of at least 0.5 mmole/g and is free of extractable monomers with reactive double bonds;

characterised in that the mixture before or during the polyaddition reaction is subjected to a shaping step and the resulting flexible preform is cured to a structurally rigid moulded body by radical-triggered polymerisation of the reactive double bonds.

2. (Amended) Method according to claim 1, characterised in that the mixture of starting components contains isocyanate and (meth)acrylate containing hydroxyl groups in a ratio of about 1 : 1 between the OH and NCO groups, and that at least one of the starting components is bifunctional or polyfunctional.

3. (Twice Amended) Method according to claim 1, characterised in that the curing by radical-triggered polymerisation occurs without toxic emissions.

4. (Twice Amended) Method according to claim 1, characterised in that the preform is produced in the shape of a film, tape, ribbon, cord, or strand.

6. (Twice Amended) Method according to claim 1, characterised in that curing of the preform occurs by radical polymerisation of the free double bonds while applying at least one measure selected from the group consisting of elevated pressure, elevated temperature, irradiation with microwaves, and high-level radiation.

7. (Twice Amended) Method according to claim 1, characterised in that to the mixture of starting components at least one catalyst for triggering and/or accelerating a radical induced polymerisation of the reactive double bonds is added in an amount of up to 5 % by weight of the starting mixture.

8. (Twice Amended) Method according to claim 1, characterised in that two or more preforms, which are brought in mutual contact are bonded together while applying elevated pressure and elevated temperature to yield composites or laminates and cured.

9. (Amended) Method according to claim 8, characterised in that fibre material is inserted between the preforms prior to definite curing by radical polymerisation.

10. (Twice Amended) Method according to claim 5, characterised in that the filler is added in a concentration of at most 80 % by weight of the total weight of the polyurethance material.

11. (Twice Amended) Method according to claim 5, characterised in that the fibre material is present in the form of unidirectional fibre strands, woven or nonwoven fibre fabric.

13. (Amended) Method according to claim 6, characterised in that the curing of the preform is carried out applying at least one condition or measure selected from the group consisting of a pressure of 2 to 10 bar, a temperature of 80 to 150°C. irradiation with light having a wavelength of 300 to 500 nm, and irradiation with microwaves having a wavelength of 1 to 1000 mm.

14. (Amended) Moulded body obtained from a preform having a polyurethane matrix from isocyanate and monomers with reactive double bonds containing hydroxyl groups, where the monomers containing hydroxyl groups are present in a stoichiometric or substoichiometric ratio

relative to the isocyanate and the preform has a content of nonextractable, reactive double bonds – as determined by DSC – of at least 0.5 mmole/g and is free of extractable monomers with reactive double bonds, characterised in that the moulded body is present in the form of a structurally rigid object or formed part cured by radical polymerisation of the reactive double bonds of the preform.

15. (Amended) Moulded body according to claim 14, characterised in that at least one of the starting compounds is bifunctional or polyfunctional.

16. (Twice Amended) Moulded body according to claim 14, characterised in that it is of a nature selected from the group consisting of colourless, translucent, air permeable, and foamed.

17. (Twice Amended) Moulded body according to claim 14, characterised in that it contains at least one additive selected from the group consisting of a filler, fibre material, and coloured pigment.

18. (Twice Amended) Moulded body according to claim 14, characterised in that it is present as a composite or laminate formed from at least two curable preforms.

19. (Twice Amended) A moulded body made of polyurethane material, obtained by a method according to claim 1.

20. (Amended) Method for the production of structurally rigid objects or formed parts made of a polyurethane material, comprising

(a) providing a flexible preform having a polyurethane matrix produced by a polyaddition reaction from isocyanate and monomers that have reactive double bonds and that contain hydroxyl groups which preform has a content of nonextractable, reactive double bonds – as determined by DSC – of at least 0.5 mmole/g and is free of extractable monomers having reactive double bonds, and

(b) curing the preform via radical polymerisation until a structurally rigid object or formed part is obtained.

22. (Twice Amended) Method according to claim 20, wherein the structurally rigid objects or formed parts are selected from the group consisting of elements for technical applications, toys, utensils, art objects, and decorative objects.

Please add new claims 25 through 50 as follows.

25. (New) Method according to claim 20, wherein the preform is elastic.

26. (New) Method according to claim 20, wherein the preform is foamed.

27. (New) Method according to claim 20, wherein the monomers comprise (meth)acrylate that contains hydroxyl groups.

28. (New) Method according to claim 20, wherein curing of the preform via radical polymerisation is accomplished during or after a further step of mechanical forming of the preform.

29. (New) Method according to claim 28, wherein said further step of mechanical forming of the preform is accomplished without removal of material.

30. (New) Method according to claim 28, wherein said further step of mechanical forming of the preform comprises at least one action selected from the group consisting of bending, twisting, pressing, rolling, and deep-drawing.

31. (New) Method according to claim 22, wherein the elements for technical applications are selected from the group consisting of elements for mechanical construction, elements for mechanical support, optical wave guides, tool components, covers, protective films, and electrical, thermal or acoustic insulating elements.

32. (New) Method according to claim 1, wherein the mixture of starting components is flowable.

33. (New) Method according to claim 1, wherein the monomers with reactive double bonds comprise at least one compound selected from the group consisting of acrylate and methacrylate.

34. (New) Method according to claim 1, wherein the shaping step comprises at least one method selected from the group consisting of casting, pressing, rolling, extruding, deep-drawing, and foaming.

35. (New) Method according to claim 1, wherein the flexible preform is elastic.

36. (New) Method according to claim 1, wherein the flexible preform is cured after a further forming step.

37. (New) Method according to claim 36, wherein the further forming step is accomplished without removal of material.

38. (New) Method according to claim 36, wherein the further forming step is selected from the group consisting of bending, twisting, pressing, rolling, deep-drawing, cutting, carving, grinding, and scraping.

39. (New) Method according to claim 6, wherein the high-level radiation comprises ionising radiation.

40. (New) Method according to claim 7, wherein the catalyst is a hot-curing catalyst or a photocatalyst.

41. (New) Method according to claim 7, wherein the catalyst is added in an amount of 0.1 to 1% by weight.

42. (New) Method according to claim 8, wherein the preforms are in the form of films, tapes, ribbons, or plates.

43. (New) Method according to claim 8, wherein the preforms are piled up as layers or glued together with the aid of an adhesion promoter.

44. (New) Method according to claim 8, wherein the composites or laminates are cured with the aid of light.

45. (New) Method according to claim 9, wherein the fibre material is in the form of woven or nonwoven fibre fabric.

46. (New) Method according to claim 10, wherein the filler is added at a concentration of 20 to 75% by weight.

47. (New) Method according to claim 5, wherein the fibre material is selected from the group consisting of glass fibres, carbon fibres, aramide fibres, cellulose fibres, polyethylene fibres, and other plastic fibres.

48. (New) Molded body according to claim 14, wherein the monomers comprise (meth)acrylate containing hydroxyl groups.

49. (New) Molded body according to claim 14, wherein the polyurethane matrix contains additives.

50. (New) Molded body according to claim 14, which exhibits a surface treatment selected from the group consisting of a coating, coloration, painting, and texture.

APPENDIX B

VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

IN THE CLAIMS:

Please cancel claims 21, 23, and 24 without prejudice.

Please amend claims 1 through 4, 6 through 11, 13 through 20, and 22 as follows.

1. (Amended) Method for the production of moulded bodies [on the basis] of a polyurethane material where

(a) a [preferably flowable] mixture of starting components is prepared which contains, on one hand isocyanate and on the other hand monomers with reactive double bonds and containing hydroxyl groups[, preferably aerylate or methacrylate containing hydroxyl groups,] where the monomers containing hydroxyl groups are used in a stoichiometric ratio or in less than the stoichiometric amount relative to isocyanate; and

(b) the mixture is subjected to a [nonradical triggered] polyaddition reaction that is not triggered by radicals and that is generating a radical-polymerisable polyurethane preform having a [contant] content of nonextractable, reactive double bonds -- [that can be] as determined by DSC - of at least 0.5 mmole/g and is free of extractable monomers with reactive double bonds;

characterised in that the mixture before or during the polyaddition reaction is [brought to a desired form] subjected to a shaping step [by methods of plastics engineering known per se, in particular by casting, pressing, rolling or extruding,] and the resulting flexible[, where applicable elastic] preform is [definitely] cured to a structurally rigid moulded body [at any time, preferably after a further forming, particularly without the removal of material,] by radical-triggered polymerisation of the reactive double bonds.

2. (Amended) Method according to claim 1, characterised in that the mixture of starting components contains isocyanate and (meth)acrylate containing hydroxyl groups in a ratio of about 1 : 1 between the OH and NCO groups, and that at least one of the starting components is [at least] bifunctional[, preferably tri] or polyfunctional.

3. (Twice Amended) Method according to claim 1, characterised in that the curing by radical-triggered polymerisation occurs [essentially] without toxic emissions.

4. (Twice Amended) Method according to claim 1, characterised in that the preform is produced in the shape of a film, tape, ribbon, cord, or strand [or any mould, and subsequently subjected to at least one further forming, preferably without the removal of material, for instance by bending, twisting, pressing, rolling, or deep-drawing].

6. (Twice Amended) Method according to claim 1, characterised in that [a definite] curing of the preform occurs by radical polymerisation of the free double bonds while applying at least one measure selected from the group consisting of elevated pressure, [and/or] elevated temperature, [and/or] irradiation with microwaves, [or] and [energy-rich] high-level radiation[, particularly ionising radiation].

7. (Twice Amended) Method according to claim 1, characterised in that to the mixture of starting components at least one catalyst [adapted to trigger] for triggering and/or [accelerate] accelerating a radical[-type] induced polymerisation of the reactive double bonds is added[, particularly a hot-curing or photocatalyst,] in an amount of up to 5 % by weight of the starting mixture [, preferably 0.1 to 1 % by weight].

8. (Twice Amended) Method according to claim 1, characterised in that two or more preforms, [particularly in the form of films, tapes, ribbons, or plates,] which are brought in mutual contact[, preferably piled up as layers or glued together with the aid of an adhesion promoter,] are bonded together while applying elevated pressure and elevated temperature to yield composites or laminates [of any desired layer thickness,] and [definitely] cured[, where appropriate with the aid of light].

9. (Amended) Method according to claim 8, characterised in that fibre material[, particularly in the form of woven or nonwoven fibre fabric,] is inserted between the preforms prior to definite curing by radical polymerisation.

10. (Twice Amended) Method according to claim 5, characterised in that [to] the [starting components a] filler is added in a concentration of at most 80 % by weight of the total weight of the polyurethance material[, preferably of 20 to 75 and particularly of about 40 to 70 % by weight].

11. (Twice Amended) Method according to claim 5, characterised in that the fibre material is present in the form of unidirectional fibre strands, woven or nonwoven fibre fabric [and preferably contains glass fibres, carbon fibres, aramide fibres, polyethylene fibres, cellulose fibres, and/or other suitable plastic fibres].

13. (Amended) Method according to claim 6, characterised in that the curing of the preform [occurs] is carried out applying at least one condition or measure selected from the group consisting of [at] a pressure of 2 to 10 bar, [and/or] a temperature of 80 to 150°C, [and/or under] irradiation with light having a wavelength of 300 to 500 nm, [or] and irradiation with microwaves having a wavelength of 1 to 1000 mm.

14. (Amended) Moulded body [on the basis of] obtained from a preform [produced by a nonradical triggered polyaddition reaction, with] having a polyurethane matrix from isocyanate and monomers with reactive double bonds containing hydroxyl groups[, particularly (meth)acrylate containing hydroxyl groups and, where appropriate, from further additives], where the monomers containing hydroxyl groups are present in a stoichiometric or substoichiometric ratio relative to the isocyanate and the preform has a content of nonextractable, reactive double bonds – [that can be] as determined by DSC – of at least 0.5 mmole/g and is free of extractable monomers with reactive double bonds, characterised in that the [preform] moulded body is present in the form of a structurally rigid object or formed part [definitely] cured by radical polymerisation of the reactive double bonds of the preform.

15. (Amended) Moulded body according to claim 14, characterised in that [prior to the polyaddition reaction, isocyanate and (meth)acrylate containing hydroxyl groups are present as the starting components in a ratio of about 1 : 1 of the OH and NCO groups, and that] at least one of the starting compounds is [at least] bifunctional[, preferably tri] or polyfunctional.

16. (Twice Amended) Moulded body according to claim 14, characterised in that it is of a nature selected from the group consisting of colourless, [and] translucent, [more particularly crystal clear] air permeable, and foamed.

17. (Twice Amended) Moulded body according to claim 14, characterised in that it contains at least one [of the following] additive[s:] selected from the group consisting of a filler, fibre material, and coloured pigment[, and/or exhibits a surface treatment, particularly a coating, coloration, painting and/or texture].

18. (Twice Amended) Moulded body according to claim 14, characterised in that it is present as a [cured] composite or laminate formed from at least two curable preforms.

19. (Twice Amended) [Polyurethane-based] A moulded body made of polyurethane material, [that can be] obtained by a method according to claim 1.

20. (Amended) Method for the production of structurally rigid objects or formed parts made of a polyurethane material, comprising

(a) providing [Use of] a flexible[, where appropriate elastic] preform [with] having a polyurethane matrix produced by a [nonradical triggered] polyaddition reaction from isocyanate and monomers [with] that have reactive double bonds and that [containing] contain hydroxyl groups[, wherein said polyaddition reaction is not triggered by radicals, particularly (meth)acrylate containing hydroxyl groups, and where appropriate further additives,] which preform has a content of nonextractable, reactive double bonds – [that can be] as determined by DSC – of at least 0.5 mmole/g and is free of extractable monomers [with] having reactive double bonds, [for the production of a structurally rigid object or formed part by definite] and

(b) curing [of] the preform via radical polymerisation until a structurally rigid object or formed part is obtained[, preferably free of emissions, after or during a further mechanical forming of the preform, particularly without the removal of material].

22. (Twice Amended) Method [Use] according to claim 20, wherein the structurally rigid objects or formed parts are selected from the group consisting of elements for technical applications, [for the production of technical formed parts, design and support elements, optical wave guides, tool components, covers and protective films, electrical, thermal or acoustic insulating elements,] toys, utensils, art objects, [or] and decorative objects.